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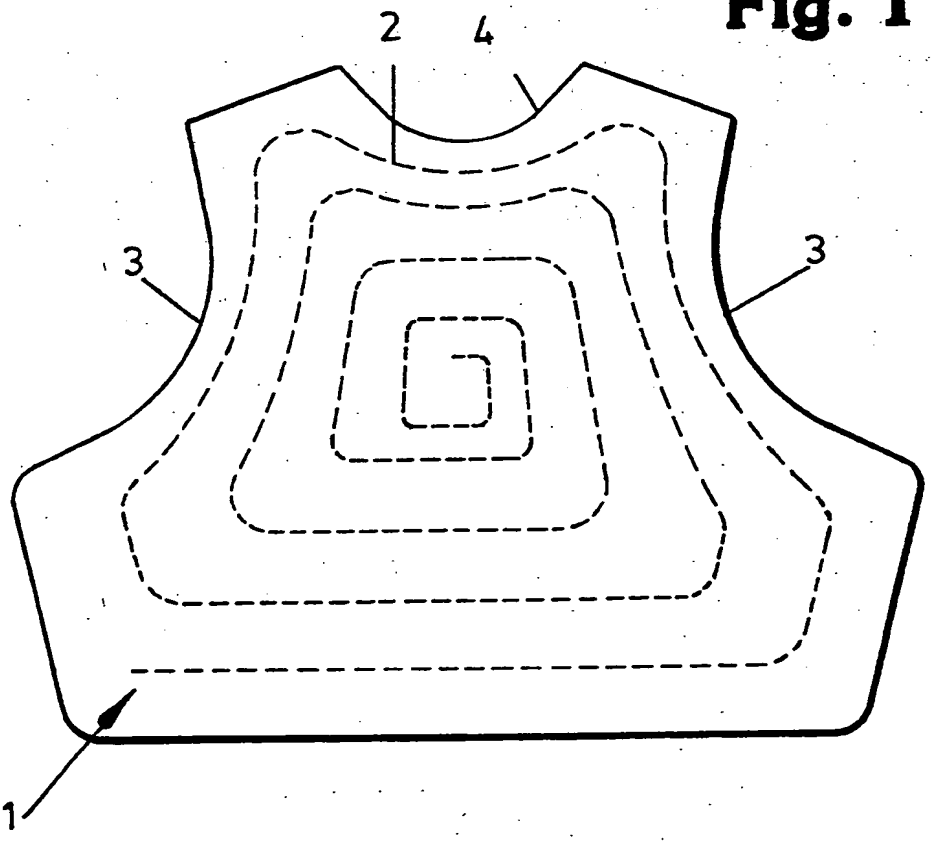
(54) Anti-ballistic garment

(57) An article 1 of soft body armour comprises a plurality of layers of anti-ballistic material joined together by a filament 2 stitched through the layers and extending in a generally spiral manner.

Fig. 1



At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

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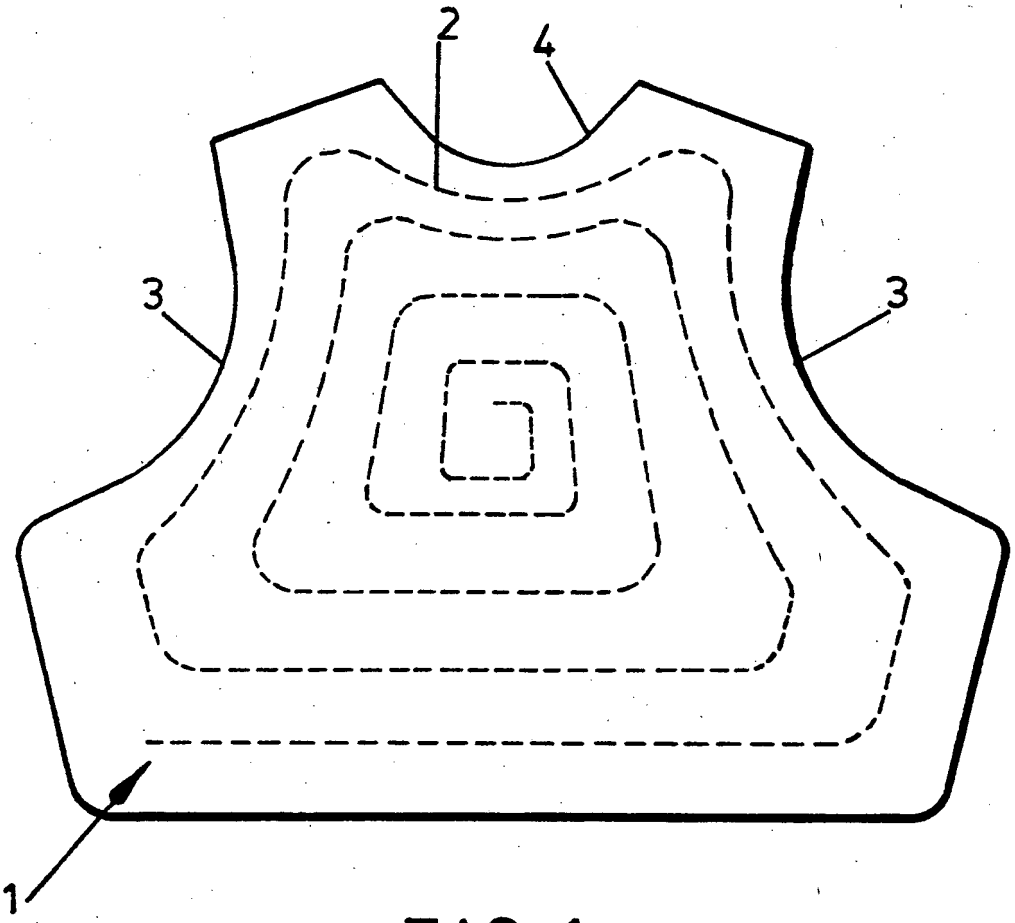

FIG.1

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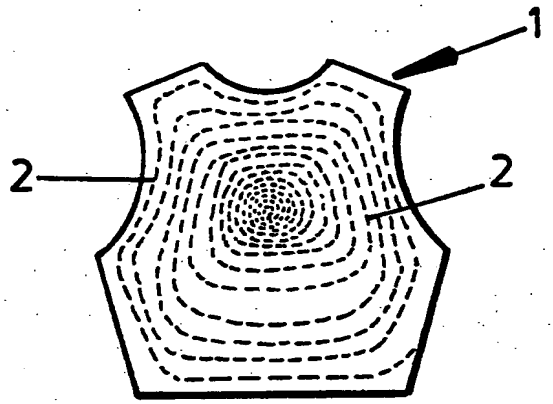

FIG. 2

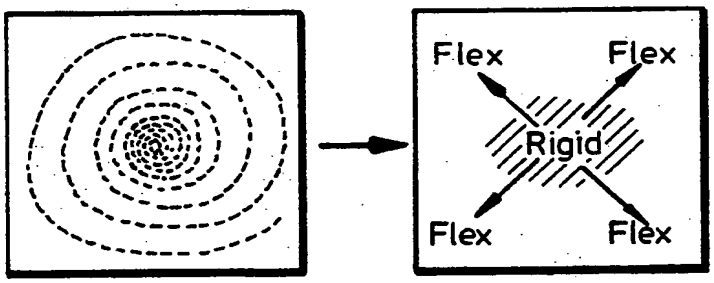

FIG. 3

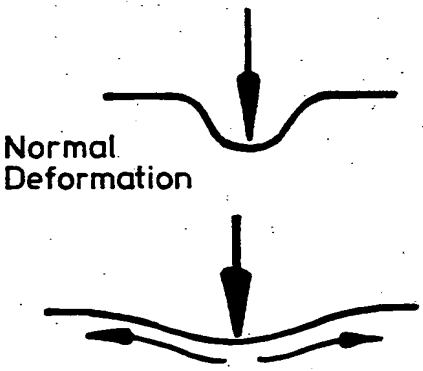

FIG. 4

BODY ARMOUR

This invention relates to so-called soft body armour such as used as protection for a wearer against bullets and similar ballistic projectiles.

It is well known that soft body armour comprises a plurality of layers of anti-ballistic material, usually an anti-ballistic nylon or an aramid, eg. KEVLAR (Registered Trade Mark). The type of material used and the number of layers depends of the 'duty' for which the armour is designed but in all cases it is necessary to secure the individual layers together to prevent 'ballooning' when struck by a bullet and therefore provide a multi-hit capability for the armour.

Various stitching patterns are used for joining the layers together. One such pattern is a 'cross-stitch' pattern but this can give rise to points of weakness at the cross-over points of the lines of stitching.

It is an object of the present invention to obviate or mitigate the abovementioned disadvantage.

According to the present invention there is provided an article of soft body armour comprised of a plurality of layers of anti-ballistic material joined together by a filament stitched through the layers and extending in a generally spiral manner.

The article of body armour may, for example, be a jacket, vest or other garment to be worn by personnel requiring protection. Alternatively. the article of soft body armour may be in the form of a panel which is intended to be located in a carrier garment (eg. a carrier vest) to be worn by a person requiring protection.

The layers of anti-ballistic material may be anti-ballistic nylon or an aramid (eg. KEVLAR).

The stitching filament should be a high tensile thread (eg. KEVLAR).

In an advantageous embodiment of the invention, the spiral originates in a region of the body armour where most protection is required for the wearer and the turns of the spiral are comparatively close together in this region but become of wider spacing towards the edge of the armour. Such an arrangement ensures maximum protection where required combined with flexibility of the garment in its outer regions.

The invention will be further described by way of example only with reference to the accompanying drawings, in which:

Fig. 1 is a diagrammatic representation of one embodiment of body armour in accordance with the invention in the form of a panel for incorporation in a carrier vest;

Fig. 2 is a modification of the panel of Fig. 1;

Fig. 3 is a diagrammatic representation of the flexural properties of ballistic layers bonded by spirally extending stitching; and

Fig. 4 is a diagrammatic indication of the manner in which shock (resulting from impact of a ballistic projectile) spreads with the spiral stitching.

Fig. 1 illustrates a panel 1 which is intended to be incorporated in a carrier vest. More particularly the panel is intended to be supported by the vest around the chest of a wearer for which purpose arm and neck recesses 3 and 4 are respectively provided as shown. A similar panel will also be provided in the carrier vest for location around the back of a wearer. The panel is comprised of a number of layers of an anti-ballistic material (eg. a ballistic nylon or an aramid such as KEVLAR) stitched together by a high tensile thread 2 which extends in a generally spiral pattern as shown.

The spiral begins approximately at the centre of

the vest and its successive turns approach the edge regions of the panel where the stitching is contoured around the arm and neck recesses.

In the panel 1 of Fig. 2 the spiral (ie. the stitching 2) originates near the centre of the panel or the part near the centre which requires most protection and its successive turns are of increasing spacing moving outwardly away from the point of origin of the spiral. Thus the spiral is most dense towards its centre whereas its less dense outer regions may be contoured to adapt to the shape of the outer edge regions of the panels.

For the panel of Fig. 2, the greatest areas of protection are obtained where the spiral is most dense (eg. over the heart of the wearer) but the armour is somewhat rigid. The outer edge regions of the body armour provide less protection (because of the comparatively wide spacing of the turns of the spiral) but have greater flexibility. There is thus a gradient of flex increasing from the centre outwards, as illustrated by the schematic representation of Fig. 3.

The spiral pattern offers an efficient way of dissipating the energy of an impacting bullet by spreading the shock wave in such a way as to involve the greatest number of individual fibres in the shortest possible time, across the whole area of the panel. This is due to (a) the seam pattern, and (b) the long length of the one continuous seam provided by the spiral stitching.

The effect of spreading the shock wave is to reduce the energy absorbed per unit area and therefore reduce the back-face deformation, ie. the back-face signature or 'dish' will be wider and shallower (see Fig. 4).

This reduction in back-face deformation obtained with the spiral stitching makes it possible to use

fewer layers and/or a less expensive anti-ballistic material than in a jacket or the like in which the layers are joined by a cross-stitching pattern. Thus the invention provides a cost saving.

A further advantage of the invention is that the use of a long continuous spiral seam avoids numerous stop/starts during machining and consequently numerous points of weakness.

The result is a garment which has the combined advantages of rigid panel protection and flexible panel mobility. It gives the optimum compromise between a garment that is too stiff to be worn comfortably and one that is too flexible and not protective enough.

CLAIMS

1. An article of soft body armour comprised of a plurality of layers of anti-ballistic material joined together by a filament stitched through the layers and extending in a generally spiral manner.

2. An article as claimed in Claim 1 wherein the spiral originates in a region of the body armour where most protection is required for the wearer and the turns of the spiral are comparatively close together in this region but become of wider spacing moving away from this region.

3. An article as claimed in Claim 1 or 2 in the form of a panel for incorporation in a carrier garment.

4. An article as claimed in Claim 3 wherein the panel is shaped to have a neck recess and two arm recesses.

5. An article as claimed in Claim 1 or 2 in the form of a garment.

6. An article as claimed in any one of Claims 1 to 5 wherein the anti-ballistic material is an anti-ballistic nylon.

7. An article as claimed in any one of Claims 1 to 5 wherein the anti-ballistic material is an aramid.

8. An article of soft body armour substantially as hereinbefore described with reference to Fig. 1 or 2 of the accompanying drawings.

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